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SITE ASSESSMENT SECTION

Ms. Jeanne Griffin
United States Environmental Protection Agency
Region 5
77 W. Jackson Blvd., HSM-5J
Chicago, IL 60604

**RE: Expanded Site Inspection Site Evaluation Report - Mogul Corporation
OHD 004 180 675**

Dear Ms. Griffin:

Enclosed is the Expanded Site Inspection Site Evaluation Report for the Mogul Corporation site in Chagrin Falls, Ohio. The Hazard Ranking System scoresheets are also enclosed.

If you have any questions or comments regarding these documents, please contact me at 513-241-0149.

Sincerely,

Gabriel Rood
Project Manager

Enclosures

cc: Carl Norman - EPA Project Officer (without enclosure)
Brigitte Manzke - EPA Contract Officer (without enclosure)
Laura Fay - OEPA Field Operations Officer (disk copy)
Michael Bolas - OEPA Northeast District Office
Majid Chaudry - PRC Program Manager (without enclosure)
File



July 2, 1993

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A handwritten signature in cursive script, appearing to read "Gabriel Rood".

for Gabriel Rood
Project Manager

Enclosure

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**EXPANDED SITE INSPECTION
SITE EVALUATION REPORT
FOR
MOGUL CORPORATION
PINE STREET
CHAGRIN FALLS, OHIO 44022**

U.S. EPA ID NO.: OHD 004 180 675

Prepared for:

**U.S. ENVIRONMENTAL PROTECTION AGENCY
Site Assessment Section
77 West Jackson Boulevard
Chicago, IL 60604**

EPA Work Assignment No.	:	36-5JZZ
EPA Region	:	5
Date Prepared	:	August 24, 1993
Contract No.	:	68-W8-0084
PRC No.	:	030-003609
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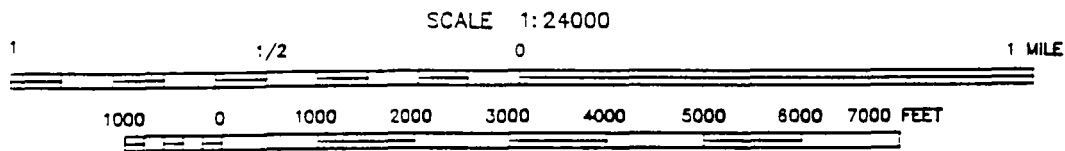
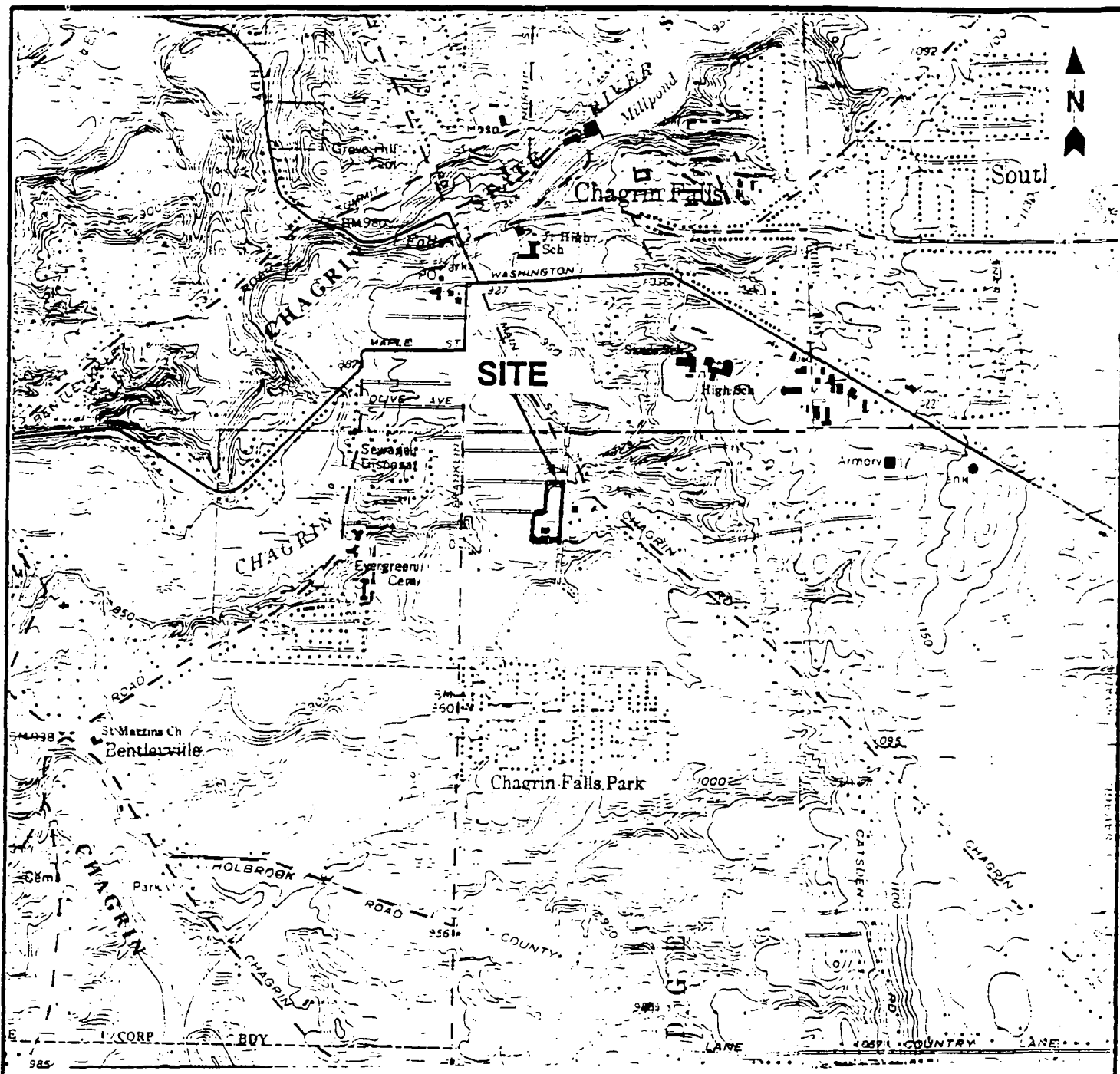
1.0 INTRODUCTION

Under Contract No. 68-W8-0084, Work Assignment No. 36-5J22, PRC Environmental Management, Inc. (PRC), has evaluated the Mogul Corporation site (Mogul) in Chagrin Falls, Geauga County, Ohio, as a potential candidate for the National Priorities List (NPL) and has prepared this expanded site inspection site evaluation report. Using the Hazard Ranking System (HRS), PRC evaluated the site to determine whether it poses a threat to human health and the environment and the extent of any threat. This report presents the results of PRC's evaluation and summarizes the site conditions and targets pertinent to the migration and exposure pathways associated with the Mogul site. Information was obtained from the screening site inspection, the limited environmental site investigation, the site reconnaissance performed by PRC, and EPA files. Based on the information available, the Mogul site does not receive an HRS score of 28.50 or greater.

This report has five sections including this introductory section. Section 2.0 describes the site. Section 3.0 discusses site operations, site history, and the source associated with the site. Section 4.0 provides information about the four migration and exposure pathways (groundwater migration, surface water migration, soil exposure, and air migration) that can be scored. Section 5.0 presents PRC's conclusions based on the site evaluation.

2.0 SITE DESCRIPTION

The Mogul site is located at 7145 Pine Street in the southern portion of Chagrin Falls, Geauga County, Ohio (Figure 1) (E&E 1990). The Mogul facility, a chemical manufacturing and blending plant, is located in a residential and commercial area (E&E 1990; PRC 1993g). Surrounding the site to the north, south, and west are residential areas. To the east is the Norfolk and Western Railroad (USGS 1962) and an office park (PRC 1993g). The office park was reportedly built over a former landfill that was not owned by Mogul but was used by Mogul (PRC 1993g). This landfill area is outside the boundaries of the Mogul site, and was not included in this evaluation. Two intermittent unnamed tributaries of the Chagrin River are located north and south of the site (USGS 1962). The predominant land use within 1 mile of the site is residential and commercial (PRC 1993g; USGS 1962).



QUADRANGLE LOCATION

MOGUL CORPORATION
CHAGRIN FALLS, OHIO

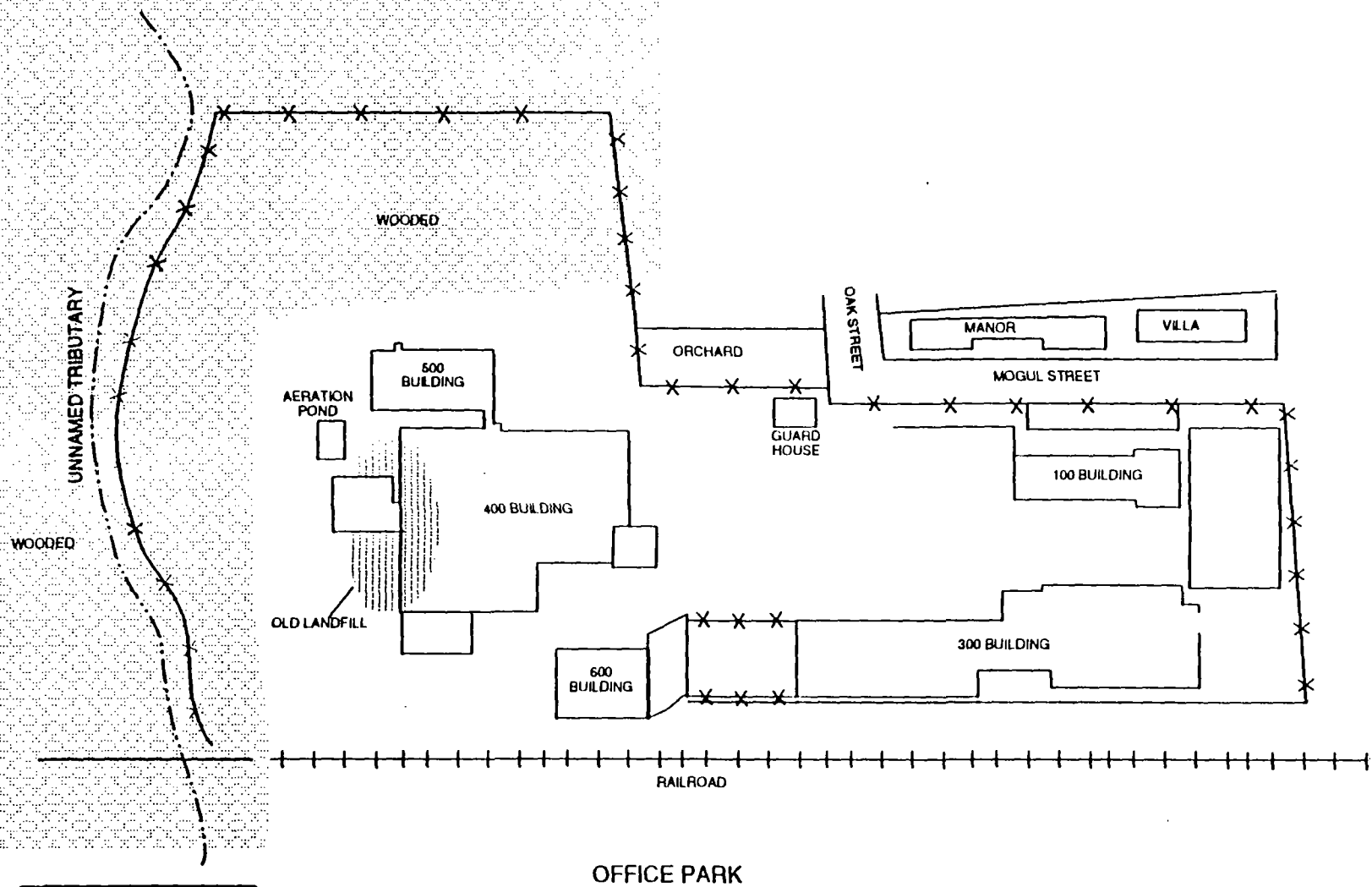
FIGURE 1
SITE LOCATION

PRC ENVIRONMENTAL MANAGEMENT, INC.

SOURCE: Modified from USGS 1963.

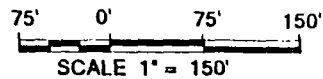
The 17.5-acre site is L-shaped and contains five buildings, a former landfill, an abandoned industrial wastewater treatment system and aeration pond (Figure 2) (E&E 1990; Dexter 1991a). The site is surrounded by a chain-link fence along the north, south, and western boundaries with a guard at the gate entrance (PRC 1993g). There are two buildings located along the east boundary of the site. These include building 300, where products are manufactured, and building 600, where empty product drums are stored. The drums originally contained materials used during the manufacturing process. Between buildings 300 and 600 is a paved fenced-in empty drum storage area. A railroad track parallels the east side of buildings 300 and 600. A third building, building 100, is located west of building 300 and is used for office space. A large, grassy yard lies on the south end of building 100 (E&E 1990; PRC 1993g).

The main office building (building 400) is southwest of building 300 and is situated at the approximate center of the site. Along the west side of building 400 is building 500. Buildings 400 and 500 were built on top of the northern portion of the old on-site landfill (E&E 1990; PRC 1993g). Building 500 is an addition to building 400. Soil borings were drilled before the construction of building 400 within the area of the landfill. Samples were collected from borings drilled to depths of up to 25 feet below the ground surface (Herron 1978; Herron 1984); based on inspection of the samples the borings did not appear to penetrate the landfill. The southern portion of the old landfill is covered by a lawn. There is no remaining surficial evidence of any past landfill activities. A portion of the former wastewater treatment system, an aeration pond covered with a metal grating, is also located on the south side of building 400. An unnamed tributary of the Chagrin River is located approximately 150 feet south of building 400 (PRC 1993g).



LEGEND

- ++++ Railroad
- x-x-x- Fence
- .-.- Creek
- [Stippled Box] Wooded Area



SOURCE: Modified from E & E, 1990.

MOGUL CORPORATION CHAGRIN FALLS, OHIO
FIGURE 2 SITE FEATURES
PRC ENVIRONMENTAL MANAGEMENT, INC.

3.0 SITE OPERATIONS AND HISTORY

The site is currently owned and operated by Diversey Water Technologies Inc. (Diversey) (Diversey no date a). Diversey provides chemicals, equipment, and consultative services for the treatment of scale, corrosion, and biological contamination in water (Diversey no date b). Mogul, which was acquired by Diversey in June 1992, previously owned the site (E&E 1990; Diversey no date a). The Mogul facility was a branch of the Dexter Water Management Systems (Diversey no date b). Mogul manufactured chemicals for research firms and for water treatment. General Biochemicals, Inc., a subsidiary of Mogul, began operations at the site in 1962, producing various types of chemicals for sale to research firms. The subsidiary produced carcinogenic animal diets and chemicals for the water treatment industry. Different bulk chemicals and animal diets were blended together to produce the product. It is not known if the diets were fed to animals on the Mogul site. Mogul phased out the laboratory animal diet production in the early 1970s, producing water treatment chemicals only (E&E 1990). The site is currently classified as a small quantity generator (Mogul 1980). Before Mogul's ownership, various other businesses and residents owned the property (Dexter 1990).

Between 1962 and 1968, a 300-square-yard landfill was operated on site. The landfill was located in the southeast part of the property (Figure 2). Building 400 and building 500 currently occupy the northern portion of the old landfill (E&E 1990; Dexter 1991a). Drums containing chemical wastes, dead laboratory animals, and general refuse were reportedly placed in the landfill (E&E 1990). It is not known if the dead animals resulted from experiments conducted on site. Solid feed materials and sludges from organic processing were also disposed of in the landfill. Approximately 5 gallons of sludge was disposed of per day. The sludge contained a varied mixture of phenolic protein and an organic tar residue (Biochemicals 1964). The type of organic processing that produced the sludge has not been identified. The Mogul RCRA 3010 notification identified trichloroethylene, O-dichlorobenzene, hydrazine and ethylenebis dithiocarbamic acid, salts and esters as chemical product wastes generated by their processes (EPA 1980). It is possible that any of these wastes were disposed of in the on-site landfill.

General Biochemicals held a Water Pollution Control Board (WPCB) Permit No. 1185.5 for two discharge points for treated industrial waste and sanitary sewage. One discharge emptied into an unnamed intermittent tributary of the Chagrin River located along the southern border of the site, and the other emptied into the Chagrin River (Geauga County Health Department 1963; Swain 1970). The permit stated that phenols, ether, casein, and chromates were used as raw materials in processes (Swain 1970). In 1963, the Geauga County Health Department investigated industrial and sewage waste discharges from the General Biochemicals, Inc. site in response to a complaint regarding the color and odor of the unnamed tributary (E&E 1990; Geauga County Health Department 1963). During the inspection, the plant superintendent was interviewed. According to the superintendent proline picrate and picric acid were used with methyl alcohol as a solvent at the site. He also stated that methyl alcohol was the main waste and was dumped in the rear yard in small quantities. Wastes were generated during mixing vat cleaning and floor washing (Geauga County Health Department 1963).

Mogul held a National Pollution Discharge Elimination System (NPDES) Permit Number 000744 that was issued for the discharge from the on-site wastewater treatment plant (E&E 1990; Bush 1974). The NPDES permit was no longer needed after the discharge was diverted to the Chagrin Falls sanitary sewer system (Mogul 1975). In 1992, Mogul obtained an air permit to operate a spray booth (OEPA 1992).

In 1972, the Ohio Environmental Protection Agency (OEPA) received a complaint from a former employee of Mogul. According to the former employee, carcinogens were added to animal diets in one of the Mogul production buildings. The food was ground into fine powder. While the carcinogens and feed were mixed, a ventilation fan blew contaminated air from the building to the employee parking lot and possibly into the stream south of the Mogul site (Bartko 1975).

In 1990, the EPA Field Investigation Team (FIT) conducted a screening site inspection (SSI) at the Mogul site. Soil/sediment and residential well samples were collected. The samples were analyzed for target compound list and target analyte list compounds. The residential well analytical results revealed several volatile organic compounds (VOC). Several metals were also detected in soil samples in concentrations exceeding the background concentrations (E&E 1990).

In 1991, 1,2-dichloroethane (1,2-DCA) was detected in the Mogul drinking water supply wells (Dexter 1991). The OEPA subsequently conducted an evaluation of the Mogul public water supply system. Mogul had two supply wells in operation that served the site and two homes (the villa and the manors) along the western boundary of the site. OEPA found that 1,2-DCA was present in ground water samples at concentrations exceeding maximum contaminant levels (MCL) in one of the water supply wells (Well # 3) that was not in service. Samples collected from the two active supply wells contained concentrations of 1,2-DCA that did not exceed MCLs (OEPA 1991). Diversey currently obtains water from Chagrin Falls (Dexter 1991c).

In 1991, a limited environmental site investigation was conducted at the Mogul site to determine the possible source of volatile organics in their drinking water supply wells. During the investigation, a soil gas survey was conducted to identify the source of 1,2-DCA contamination. The survey revealed VOCs around the perimeter of the site. Four monitoring wells were installed between the Mogul site and the contaminated residential wells. Groundwater samples were obtained from the monitoring wells and analyzed for the target compound list and the target analyte list compounds (Malcolm Pirnie 1991). No hazardous substances were detected in the monitoring well samples. The cuttings (soils) from the monitoring wells were also analyzed. No significant concentrations of hazardous substances were detected (Dexter 1991).

In 1992, the OEPA and the Geauga County Health Department obtained 51 groundwater samples from drinking water supply wells within a 0.25-mile radius of the Mogul site to determine the extent of groundwater contamination in the area of the Mogul site. This investigation was conducted in an attempt to locate a source of the 1,2-DCA contamination detected in the Mogul supply wells and in residential wells surrounding Mogul on Oak and Pine streets. The analysis revealed 1,2-DCA or diethyl ether or both in each of the wells sampled (Gereby 1992). The Mogul site was targeted as a potential source of the groundwater contamination. Other sources identified include property adjacent to the Mogul site where the off-site landfill was located, a dry cleaner, an old foundry, and an automobile store (Plain Dealer Reporter 1992). The actual source of the 1,2-DCA and diethyl ether contamination has not been determined. Subsequently, residents on Pine and Oak streets have been receiving drinking water from Chagrin Falls (PRC 1993a).

4.0 MIGRATION AND EXPOSURE PATHWAYS

This section describes the migration and exposure pathways associated with the Mogul site. Section 4.1 discusses the groundwater migration pathway; Section 4.2 discusses the surface water migration pathway; Section 4.3 discusses the soil exposure pathway; and Section 4.4 discusses the air migration pathway.

4.1 GROUNDWATER MIGRATION PATHWAY

The groundwater pathway was evaluated for this site. This section discusses geology and soils, groundwater releases, and targets associated with the groundwater pathway at the site.

4.1.1 Geology and Soils

The Mogul site is located in the Glaciated Allegheny Plateau physiographic province. Local topography consists of eroded bedrock hills covered by a thin layer of glacial till and till-derived soils (Malcolm Pirnie, 1991). The valleys are wide, steeply sloped with level floors and filled with glacial outwash and interbedded till layers.

Groundwater in the site area is obtained from four distinct geologic units which are considered to be hydraulically connected (Swain, 1970). The uppermost unit generally consists of glacially-derived silt, clay, sand, and gravel of Pleistocene age (Northeast Ohio Area Wide Coordinating Agency 1985). The glacial materials overly three distinct bedrock aquifers. These are, in descending order, the Pennsylvanian-age Pottsville Formation (the most widely-used aquifer in the region), and the Mississippian-age Cuyahoga Group and Berea Formation (Swain, 1970). Mississippian and Devonian shales, which are not used for domestic water supplies, underlie the bedrock aquifers (Malcolm Pirnie, 1991).

Soils at the Mogul site are composed of glacially-derived clay, silt, and sand, and man-made fill. These soils range from about 10 to 20 feet thick and overly a layer of glacial till (clay and silt with a trace of sand) that is about 10 to 25 feet thick on-site. The till layer directly overlies weathered bedrock (Malcolm Pirnie, 1991).

Available information indicates that the Pottsville Formation is not present at the Mogul site, and that the uppermost bedrock consists of interbedded Mississippian-age shale, siltstone, and fine grained sandstone of the Cuyahoga Group. The Cuyahoga group is about 80 to 90 feet thick on-site, and overlies the Berea Formation, which consists predominantly of well-sorted sandstone (Swain, 1970; Malcolm Pirnie, 1991). Both the Cuyahoga Group and Berea Formation are used as water-supply aquifers in the site vicinity (ODNR). The three Mogul drinking water wells are completed in the Berea Formation.

Generally, the depth to the uppermost groundwater zone on-site is coincident with the depth to the top of the weathered bedrock surface (about 30 to 45 feet below ground surface). The direction of groundwater flow in this zone is reportedly from east to west, towards the Chagrin River, reflecting the bedrock structure (Malcolm Pirnie, 1991). The flow direction in lower portions of the aquifer is unknown, but is likely to be locally influenced by pumpage.

4.1.2 Groundwater Releases

Several groundwater investigations have been conducted in the vicinity of the Mogul site. In 1991, groundwater samples were obtained from four residential wells surrounding the Mogul site and also from the Mogul drinking water supply well. 1,2-DCA was detected in the two residential wells north of the Mogul site and in the Mogul supply well (E&E 1990). Mogul subsequently sampled three of their supply wells. The analysis revealed 1,2-DCA and diethyl ether in the well samples (Geauga County Health Department 1963). In 1992, 51 residential well samples were obtained from the residential area surrounding the Mogul site. Either 1,2-DCA or diethyl ether or both were detected in each of the 51 samples (Gereby 1992). However, the contamination was not firmly attributed to the Mogul facility, because no evidence has been found indicating that 1,2-DCA was ever used or stored at the Mogul facility. Also, the distribution of the 1,2-DCA in local groundwater indicates that it may be originating at an unknown, upgradient source.

In 1991, a limited site inspection was conducted by the Dexter Corporation, the owners of the Mogul site, to determine the source of contamination detected in the supply wells. Four monitoring wells were installed, and samples were collected. No contaminants were detected in the Mogul monitoring wells. The monitoring wells were completed in the bedrock underlying the Mogul site and were

screened at intervals ranging from 35 to 57 feet below the ground surface (Malcolm Pirnie 1991). The Mogul drinking water supply wells that contained detections of 1,2-DCA and ethyl ether were at total depths of 85 to 87 feet below the ground surface and are also completed in the bedrock. The screened interval of the supply wells is not known (Dexter no date). The residential wells that revealed 1,2-DCA and diethyl ether were detected in samples collected from wells drilled at depths within the range of 35 to 120 feet below the ground surface. The screened intervals of the residential wells are not known. The residential wells were completed within the bedrock of the Cuyahoga Group and the Berea Formation (Ohio Department of Natural Resources no date).

An observed release to groundwater from the Mogul site could not be determined by using a background well and downgradient well (Malcolm Pirnie 1991). However, an observed release of diethyl ether to groundwater from the Mogul site was assumed. This assumption was based on the fact that ether was used by Mogul (Swain 1970) and ethyl ether was detected in one of Mogul supply wells (Dexter 1991b) and diethyl ether in the residential wells surrounding the site. The assumption was also made to generate the highest possible HRS score. The 1,2-DCA groundwater contamination was not attributed to the Mogul site because there is no record of 1,2-DCA use on the site. Similarly, there is no record of any other compounds on the site that would break down into 1,2-DCA (U.S. EPA 1980). Additionally, there are several other sources of potential contamination in the area of the Mogul site (Malcolm Pirnie 1991; Vadose Research no date). Groundwater contaminated with trichloroethane and 1,1-dichloroethane has been documented in McFarlands corner, located approximately 2.5 miles southeast and topographically upgradient of the site (Vadose Research no date; USGS 1962). The source of the contamination has not been determined.

4.1.3 Targets

Residents surrounding the Mogul site obtain their drinking water supplies from the Chagrin Falls Water Company and from domestic wells (E&E 1990). Residents along the northern boundary of the Mogul site maintained domestic wells until 1992, at which time they began obtaining water from the Chagrin Falls Water Company. Mogul has also connected with the Chagrin Falls Water Company (PRC 1993a). This action was taken in response to the diethyl ether and 1,2-DCA contamination detected in the drinking water wells (Plain Dealer Reporter no date). All residents outside the Chagrin Falls Water Company service area maintain domestic wells (E&E 1990).

The Chagrin Falls Water Company obtains 25 percent of their water from groundwater wells located within the ½- to 1-mile radius of the Mogul site and 75 percent from the Cleveland Water Company (PRC 1993b). The Cleveland Water Company obtains supplies from surface water intakes located on Lake Erie outside the 15-mile downstream target distance limit (E&E 1990).

The number of domestic wells within a 4-mile radius of the site was determined by conducting a house count on the United States Geologic Survey topographic maps for the study area. The population served by the Chagrin Falls Water Company were included in the ½- to 1-mile radius of the site. Twenty-five percent of the total population was evaluated as potential targets. The population served by each of the domestic wells was determined by the average number of residents per household in Geauga and Cuyahoga counties according to the 1991 census (USGS 1962; PRC 1993c). The tables below summarize the number of drinking water wells and the population served by the wells within a 4-mile radius of the site.

TABLE 1
HOUSE COUNT

Radius (miles)	Number of Homes	
	Gauga County	Cuyahoga County
0 to ¼	9	0
¼ to ½	163	3
½ to 1	125	1
1 to 2	333	263
2 to 3	961	994
3 to 4	1,147	1,534

TABLE 2
POPULATION SERVED BY GROUND WATER

Radius (miles)	Population			
	Geauga County (3 per household)	Cuyahoga County (2.5 per household)	Chagrin Falls Water Company	Total
0 to ¼	27	0		27
¼ to ½	489	8		497
½ to 1	375	3	1,650 ⁺	2,025
1 to 2	999	658		1,657
2 to 3	2,883	2,485		5,368
3 to 4	3,441	3,835		7,276

+ Reflects 25 percent of the total population.

4.2 SURFACE WATER MIGRATION PATHWAY

Surface water runoff from the landfill on the Mogul site flows approximately 150 feet to the south into an intermittent unnamed tributary of the Chagrin River (PRC 1993g; USGS 1962). The unnamed tributary flows approximately 0.7 mile in the westwardly direction to converge with the Chagrin River. The confluence of the unnamed tributary and the Chagrin River would be the only probable point for contaminants from the Mogul site to enter local surface water. The Chagrin River continues approximately 1.6 miles to the southwest to its convergence with the Aurora River, and then flows in a northerly direction to complete the 15-mile target distance limit (USGS 1962).

Targets associated with the Chagrin River include fisheries and wetlands (PRC 1993e). No endangered species are known to occur in the Chagrin River (PRC 1993e). Surface water intakes on the Chagrin River supply water for irrigation and nurseries; no drinking water intakes have been

identified downstream from the site (PRC 1993d). The Chagrin River flows at approximately 120,496 cubic feet per second (PRC 1993f).

A release to the Chagrin River from the Mogul site is not documented. Because of the large overland flow distance (3,846 feet) and because the landfill is covered, reducing the potential for release of contaminants via surface runoff, a release to the Chagrin River is not assumed (USGS 1962; PRC 1993g). Also, due to the distance from the site to the Chagrin river, migration of detectable concentrations of hazardous substances from the Mogul site to the Chagrin River via groundwater transport does not appear likely.

In summary, due to the limited potential for release and relatively limited number of potential targets, the surface water pathway does not contribute significantly to the overall HRS score.

4.3 SOIL EXPOSURE PATHWAY

Soil samples collected within 2 feet of the ground surface at the Mogul site contained several metals at concentrations exceeding background. However, the soil samples that contained levels of metals (soil samples 56 and 57) were collected near a railroad and may reflect contamination from the railroad rather than from the site (E&E 1990).

There are no residents, schools, or day-care centers within 200 feet of potential surface soil contamination. Mogul employs approximately 125 people; however, the landfill area is covered limiting the potential exposure. There are currently no exposed wastes on surficial evidence of past landfilling activities (PRC 1993g). Because the soil exposure targets are minimal and because there is no evidence of surface soil contamination, the soil exposure pathway was not evaluated.

4.4 AIR MIGRATION PATHWAY

The landfill is covered with soil and grass and is also partially covered by a building (PRC 1993g). The potential for a release to air is low. Therefore, the air migration pathway was not evaluated.

5.0 CONCLUSIONS

Based on the SSI, the investigations conducted by Mogul and additional information gathered during this evaluation, the HRS score for the Mogul site is less than 28.50. Although contaminated drinking water wells were attributed to the Mogul site for purposes of generating an HRS score, the groundwater pathway score was low because the hazardous waste quantity and the toxicity value for diethyl ether are relatively low. The surface water pathway did not contribute significantly to the overall site HRS score because there appears to be a low potential for migration of contaminants to local surface water bodies, and also because minimal potential targets are associated with the Chagrin River. The soil exposure and air migration pathway were not evaluated due to the low likelihood of exposure or release, and because there are minimal targets associated with the pathways. The site HRS score is less than 28.5. If future hydrogeologic studies indicate that the site is a source of more highly toxic groundwater contaminants, or if other conditions change significantly, a reevaluation of the HRS score may be appropriate at that time.

REFERENCES

- Bartko, Claudia. 1975. Letter regarding reporting a case of pollution occurring at the General Biochemical Corporation, a subsidiary of Mogul. To the U.S. Environmental Protection Agency (U.S. EPA), Columbus, Ohio. December 31.
- Bush, William T. 1974. "Report on Detail Plans for Industrial Wastewater Sanitary Tie-in at Mogul Corporation, Bainbridge Township." July 24.
- Dexter Water Management Systems Division (Dexter). 1990. "Ownership of Certain Property in Bainbridge Township, Chagrin Falls, Ohio". December 5.
- Dexter. 1991a. Chagrin Plant Evacuation Drawing. Drawing No. 03-1949-0.
- Dexter. 1991b. Letter Regarding Dexter Water Management's third quarter total coliform data for wells #4 and #5 and the villa tap. From Elaine Murtaugh, Dexter. To Kay Amey, Ohio Environmental Protection Agency - Northeast District. September 30.
- Dexter. 1991c. Analytical Report. July 16.
- Dexter. no date. Well Data for Wells #1-5.
- Diversey Water Technologies Inc. (Diversey). no date a. Diversey Corporation History. Chagrin Falls, Ohio.
- Diversey. no date b. Diversey Water Technologies Inc. Fact Sheet. Chagrin Falls, Ohio.
- Ecology and Environment, Inc. 1990. Screening Site Inspection Report for the Mogul Corporation. April 6.
- Frato, R.L. 1971. Report on Detail Plans for Sewage and Industrial Waste Treatment Facility General Biochemicals, Bainbridge Township, Geauga County. Cuyahoga Falls, Ohio. October 6.
- Gauga County Health Department. 1963. Notes on an Investigation of Industrial Wastes at General Biochemicals, Inc. (Biochemicals), Bainbridge Township, Geauga County. Cuyahoga Falls, Ohio. Prepared by James P. Bosley. June 10.
- Biochemicals. 1964. General Disposal Report. July 3.
- Gereby, Clarissa. 1992. Inter-office communication regarding Chagrin Falls - Pine/Oak sampling to Rod Deals. April 30.
- Herron Testing Laboratories, Inc. (Herron). 1978. "Report of Soil Boring Operations at Two New Buildings Within the Mogul Corporation Complex, Mogul Street, Chagrin Falls, Ohio." April 12.

- Herron. 1984. Letter regarding Soil Boring Operations Mogul Corp., Chagrin Falls, Ohio. From Lawrence J. Gibel, Herron. To Charles H. Grossman P.E., Consulting Engineer, Mogul Corporation. February 28.
- Malcolm Pirnie. 1991. Limited Environmental Site Investigation of Dexter Water Management Systems.
- Mogul Corporation (Mogul). 1985. Letter regarding comments on preliminary assessment dated July 10, 1984. From Diana L. Wilbur, Mogul. To Steven H. White, Chief, Division of Solid and Hazardous Waste Management. OEPA. May 13.
- Mogul. 1973. State of Ohio Environmental Protection Agency Application for Water Pollution Control Certificate. February 21.
- Mogul. 1974. Letter Regarding the NPDES Permit #000744. From H.H. Davidson, Properties and Equipment Manager. To U.S. EPA, Chicago, Illinois. July 10.
- Mogul. 1980. Letter regarding notification of hazardous waste activity. From Diane Wilbur, Mogul. To EPA Region V. November 11.
- Northeast Ohio Areawide Coordinating Agency. 1985. Bainbridge Township, Geauga County, Ohio. Groundwater Resources Management Project. October.
- Ohio Department of Natural Resources, Division of Water (ODNR). Well Logo and Drilling Reports for Mogul Corporation. (Multiple Dates).
- OEPA. 1991. Letter regarding Geauga County, Dexter Water Management Systems non-transient water supply. From Katherine Springer Amey, OEPA. To Elaine Murtaugh, Dexter Water Management Systems. July 31.
- OEPA. 1992. Permit to Operate an Air Contaminant Source. April 24.
- OEPA. 1992. Letter regarding sampling of Well # 31. From Michael Bolas, OEPA. To Elaine Murtaugh, Director of Regulatory Affairs, Dexter Water Management Systems Division. February 19.
- Plain Dealer Reporter. no date. "Ohio EPA Finds Wells Tainted In Bainbridge."
- Plain Dealer Reporter. 1992. "Bainbridge Township Residents Seek Water Options."
- PRC Environmental Management, Inc. (PRC). 1993a. Record of telephone conversation regarding water supply for Chagrin Falls. Between Alicia Shultz, PRC and Val Davis, Chagrin Falls. April 30.
- PRC. 1993b. Record of telephone conversation regarding Chagrin Falls Water Supply. Between Alicia Shultz, PRC and Bill Sinex, Superintendent. April 30.

- PRC. 1993c. Record of telephone conversation regarding population data. Between Alicia Shultz, PRC and Population Bureau.
- PRC. 1993d. Record of telephone conversation regarding surface water intakes on the Chagrin River. Between Alicia Shultz, PRC and Al Luscyk, ODNR. June 18.
- PRC. 1993e. Record of telephone conversation regarding fishing in the Chagrin River. Between Alicia Shultz, PRC and Reno Reda, Geauga County, ODNR. June 18.
- PRC. 1993f. Record of telephone conversation regarding stream flow of the Chagrin River. Between Alicia Shultz, PRC and Anne Arnett, United States Geologic Survey. June 21.
- PRC. 1993g. Unpublished field log book. No. PH-01. March 9.
- Shoup, R.E. 1966. Inter-office communication to D.C. Hasbrouck, Northeast District Office. September 20.
- Swain, Robert L. 1970. Letter regarding Permit No. 1185. To Biochemicals Division Mogul Corp. Chagrin Falls. March 10.
- United States Department of the Interior Fish and Wildlife Service. 1977. National Wetlands Inventory. March.
- U.S. EPA. 1980. Notification of Hazardous Waste Site. August 7.
- USGS, 7.5 minute series Topographic Maps including Quadrangles: Aurora, Ohio (1962 photorevised 1984); Twinsburg, Ohio (1963 photorevised 1984); South Russel, Ohio (1963 photorevised 1984).
- Vadose Research, Inc. no date. Brief Work Plan for Soil Gas Determination, Bainbridge/Unknown source. McFarlands Corners.

APPENDIX A
PHOTOGRAPHIC LOG



Photograph No. 1
 Orientation: Looking west
 Description: The location of the landfill

Location: Mogul
 Date: 03/09/93



Photograph No. 2
 Orientation: Looking east
 Description: The location of the landfill

Location: Mogul
 Date: 03/09/93



Photograph No. 3
Orientation: Looking north
Description: The location of the loading dock

Location: Mogul
Date: 03/09/93